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CONSTRUCTION AND USE OF A VARIABLE ELECTRICAL CONTACT MAZE†

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Most human mazes present tasks which contain little or no meaning in the sense of familiar figures or designs. It has therefore been found difficult to study the factor of configuration by the maze technique. Even though the importance of the configurational aspect of the learning process is by now generally recognized, the literature contains experiments dealing chiefly with the "purely" serial-connection type of learning phenomena in mazes. The maze here described is so designed that geometric patterns of various degrees of meaningfulness and familiarity can be used as paths.

The present maze is basically an elaboration, primarily with a view to increased variability, of an apparatus that

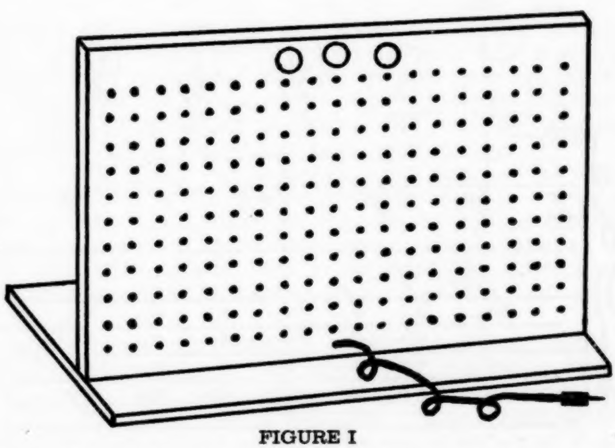

FIGURE I

Front View of Maze Showing Screw-head Contacts, Three Stimulus Lights at Top and Pencil Stylus.

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has been described by Razran (4)*. Razran placed 400 contacts in a horizontal board in square formation ½ inch apart in 20 columns and 20 rows. The contacts were so wired on the under surface that when the subject touched some of them with a pencil stylus a blue light flashed indicating a correct move, and when others were touched a red light denoted a wrong move. The path was incapable of change except by rewiring the whole set-up.

The front surface of the present maze (Figure I) consists of 1025 screw-head contacts placed in an upright ¼ inch wooden board in square formation one inch apart on center in 41 columns and 25 rows. (The number has been reduced in the figure for convenience.) At the top-center there are three stimulus lights (indicated by the three circles) colored red, white and green. A pencil stylus attached to a long flexible wire is used. The upright position of the board makes the maze more convenient for use by individuals in its present large size and also renders it an excellent apparatus for classroom demonstrations and group experiments (cf. Gurnee for the latter). The board is painted or enamelled so as to remove surface cues in the form of grain or

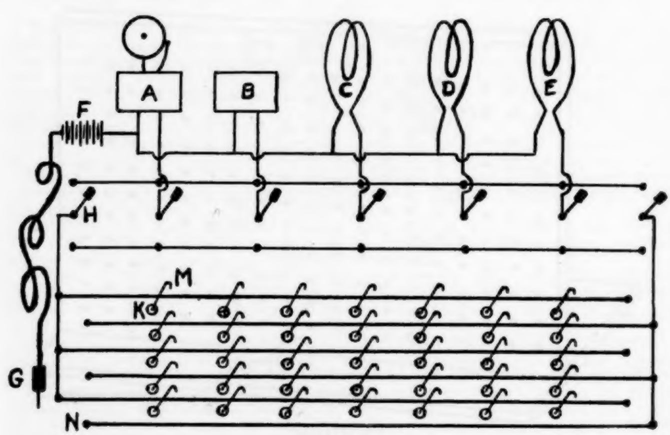


FIGURE II

Wiring Diagram of Maze. A, B, C, D and E are the Stimuli, Bell, Buzzer, Red, White and Green Lights. F is 8 Volt Current Source. G is Pencil Stylus. H is Double-throw Knife Switch. K is Eyelet of Contact Switch. M is Contact Switch. N is Cross-wire.

* The maze has also been described by Barker (1) and Gurnee (2).

other wood marks. The contacts consist of iron machine bolts ½" by ⅛", while the visual stimuli are 6-8 volt auto lights which have enough of a lag to slow down the subject's movements to a pace convenient for scoring. On the base board in the rear there are mounted a bell and buzzer which can also be used as stimuli.

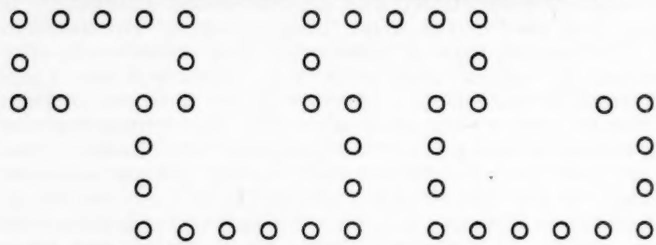
In the rear each screw-contact has mounted on it a ¾" long double-throw switch in the form of a rigid wire bent to form an eyelet at the connection end (Figure II, K) and a small hook at the free end (Figure II, M). Between the screws heavy uninsulated wires are strung horizontally and parallel (Figure II, N) and are connected alternately so that each half of the wires forms one unit. The switches on the contacts make it possible for each contact to be connected to either cross-wire unit. Double-throw knife switches (Figure II, H) are inserted in the path of each stimulus and of each cross-wire unit. The wiring diagram in Figure II shows that by appropriate adjustment of the knife and contact switches each contact can be made the source of any one or any combination of the five stimuli. Resetting of the path is rendered simple by readjustment of the system of switches. Thus, by reversing the knife switches, for example, the conversion of "correct" contacts into "wrong" ones and vice versa is made the work of a moment. The system of contact switches makes it possible to change the shape of a path completely during the course of a single experimental session, which would be ordinarily unfeasible if the whole maze had to be rewired.

The starting and ending points of a path can be established by making the desired contacts "dead," i.e., by removing them from the cross-wire, or, by connecting such "dead" contacts to the knife of one of the switches in the path of a stimulus not used in the maze, the starting and ending points can be distinguished from the rest of the maze.

Scoring can be accomplished by mimeographing sheets of paper with the shape of the correct path marked by dots or little circles. When the subject moves from a correct contact to a wrong one, a line drawn next to that correct contact in the direction of the wrong move will score an error and its direction. A retrace to a correct contact already touched can be scored by drawing a line between the two contacts involved. If one such sheet is used for each trial, all the moves made by the subject in learning the path can be recorded.

Paths of familiar geometric shape are readily set in the maze. Completely closed rectangles, triangles, etc. can be used by having the starting and ending points adjacent to each other. If a connected series of geometric figures is used, they must be left open for at least one contact in each unit (i.e., each figure must be interrupted by one wrong contact), or an endless path will exist somewhere in the maze and the subject will be unable to find the goal.*

* Such a series of figures, of the following shape, was used by the senior author in his doctoral research (to be published this year):



This forms a series of partially open rectangles.

The special advantages possessed by this maze are:

1. a high degree of pattern and stimulus adjustability; 2. ability to administer positive reward and punishment for each move; 3. the possibility of inserting a large variety of meaningful figures as paths. Of the ten criteria set forth by Knotts and Miles (3) for a good human stylus maze, the present maze fulfills the following:

1. durability; 2. rigidity; 3. possibility of permanent graphic records; 4. easily recognized goal; 5. reversibility for mirror images; 6. changeable true path in the same maze; 7. parts of path numberable for recording; 8. hidden blinds to allow use of vision. The other two criteria, (permanently smooth bottom and smooth even sides), are irrelevant to the present maze.

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